



US006626915B2

(12) **United States Patent**
Leveillee

(10) **Patent No.:** **US 6,626,915 B2**
(45) **Date of Patent:** **Sep. 30, 2003**

(54) **MEDICAL RETRIEVAL DEVICE WITH LOOP BASKET**

(75) Inventor: **Raymond J. Leveillee**, Cooper City, FL (US)

(73) Assignee: **SciMed Life Systems, Inc.**, Maple Grove, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/298,423**

(22) Filed: **Apr. 22, 1999**

(65) **Prior Publication Data**

US 2001/0049535 A1 Dec. 6, 2001

Related U.S. Application Data

(60) Provisional application No. 60/105,448, filed on Oct. 23, 1998, and provisional application No. 60/082,810, filed on Apr. 23, 1998.

(51) **Int. Cl.**⁷ **A61B 17/24**

(52) **U.S. Cl.** **606/114; 606/113; 606/127**

(58) **Field of Search** 606/114, 110, 606/113, 115, 127, 128, 159, 160, 158, 200

(56) **References Cited**

U.S. PATENT DOCUMENTS

651,395 A	6/1900	Strapp	
1,054,960 A	3/1913	Butner	
2,556,783 A	6/1951	Wallace	128/321
2,767,703 A	10/1956	Nieburgs	
3,791,387 A	2/1974	Itoh	128/320
3,828,790 A	8/1974	Curtiss et al.	128/320
3,955,578 A	5/1976	Chamness et al.	128/303.15
4,198,960 A	4/1980	Utsugi	128/6
4,326,530 A	4/1982	Fleury, Jr.	128/303.14
4,427,014 A	1/1984	Bel et al.	128/751
4,590,938 A	5/1986	Segura et al.	128/328

4,655,219 A	4/1987	Petruzzi	128/321
4,691,705 A	9/1987	Okada	128/328
4,718,419 A	1/1988	Okada	128/303.15
4,807,626 A	2/1989	McGirr	128/328
4,893,621 A	1/1990	Heyman	128/328
4,994,079 A	2/1991	Genese et al.	606/206
5,010,894 A	4/1991	Edhag	128/785
5,011,488 A	4/1991	Ginsburg	606/159
5,057,114 A	10/1991	Wittich et al.	606/127
5,064,428 A	11/1991	Cope et al.	606/127
5,084,054 A	1/1992	Bencini et al.	606/113
5,098,440 A	3/1992	Hillstead	606/108
5,147,378 A	9/1992	Markham	606/206
5,163,942 A	11/1992	Rydell	606/113
5,171,233 A	12/1992	Amplatz et al.	604/281
5,171,314 A	12/1992	Dulebohn	606/113
5,207,686 A	5/1993	Dolgin	606/113

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

CH	480059 A	12/1969
DE	2804058	8/1978
DE	3522649 A1	1/1986
DE	3501707	7/1986
DE	4212430 A	10/1993
EP	0123175 A	10/1984
SU	1228837	5/1986
WO	92/05828	4/1992
WO	95/05129	2/1995
WO	98/36694	8/1998

OTHER PUBLICATIONS

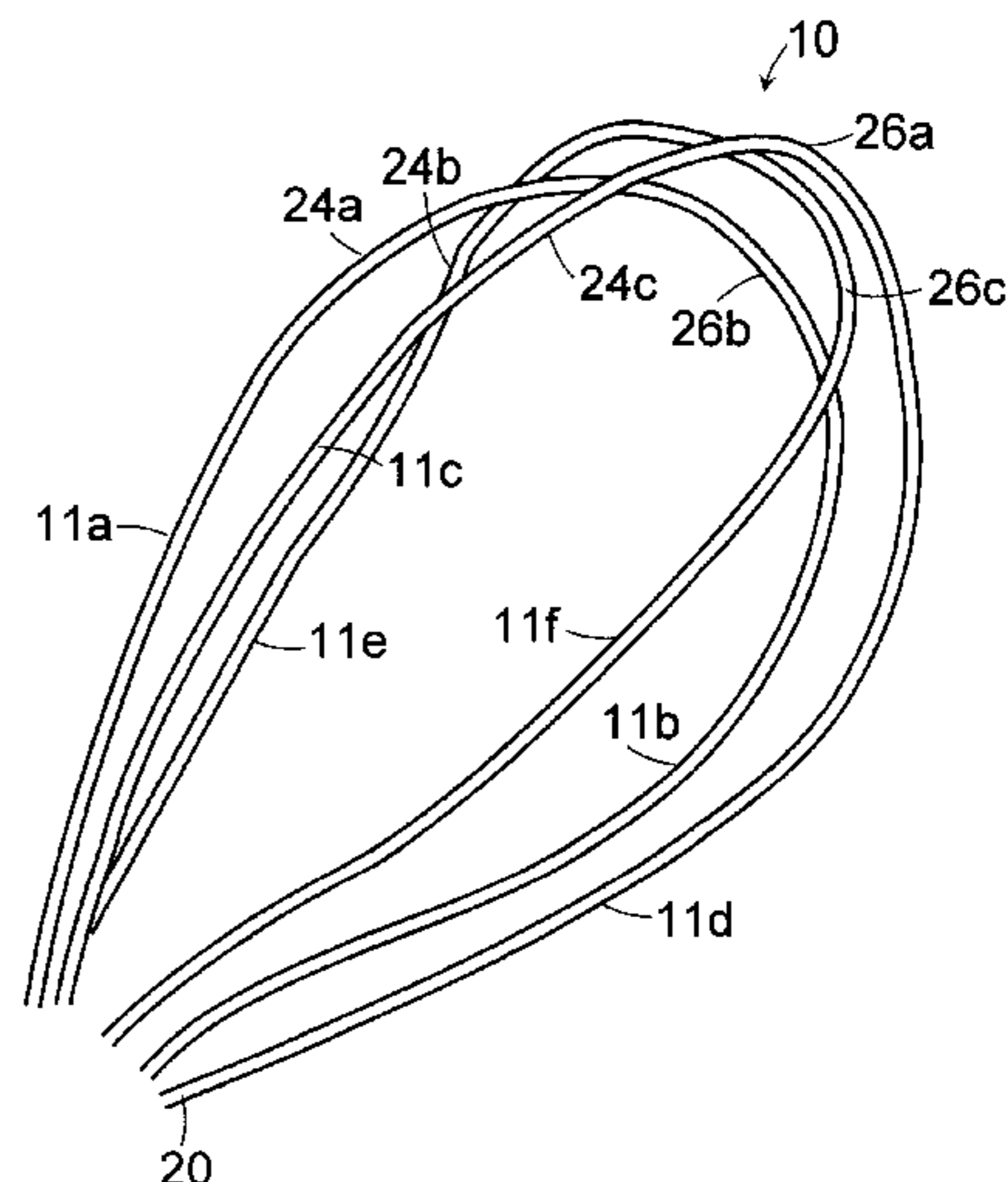
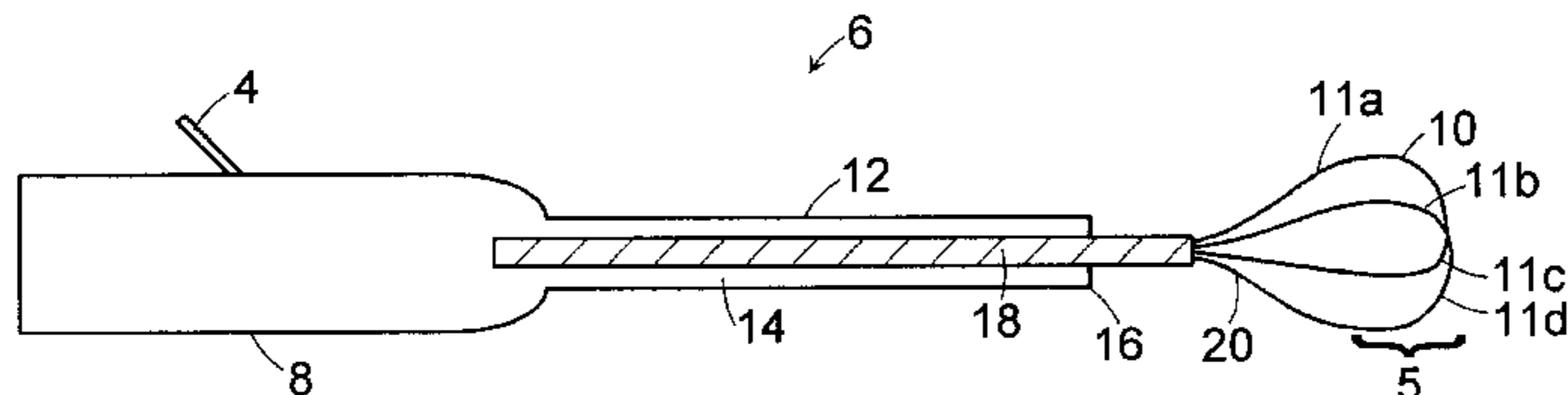
Copy of International Search Report in PCT/US99/08487.

Primary Examiner—Pedro Philogene
(74) *Attorney, Agent, or Firm*—Testa, Hurwitz & Thibault LLP

(57) **ABSTRACT**

Baskets with atraumatic distal tips allow the capture of material from difficult-to-reach areas of the body, while reducing the risk of tissue damage.

11 Claims, 2 Drawing Sheets



US 6,626,915 B2

Page 2

U.S. PATENT DOCUMENTS

5,290,294 A	3/1994	Cox et al.	606/108	5,647,870 A	7/1997	Kordis et al.	606/41
5,365,926 A	11/1994	Desai	128/642	5,693,069 A	12/1997	Shallman	606/205
5,376,100 A	12/1994	Lefebvre	606/180	5,725,525 A	3/1998	Kordis	606/41
5,417,684 A	5/1995	Jackson et al.	606/1	5,810,876 A	9/1998	Kelleher	606/205
5,421,832 A	6/1995	Lefebvre	604/53	5,823,189 A	10/1998	Kordis	128/642
5,454,370 A	10/1995	Avitall	128/642	5,846,238 A	12/1998	Jackson et al.	606/41
5,462,553 A	10/1995	Dolgin	606/113	5,853,411 A	12/1998	Whayne et al.	606/41
5,486,183 A	1/1996	Middleman et al.	606/127	6,099,534 A *	8/2000	Bates et al.	606/127
5,549,661 A	8/1996	Kordis et al.	607/99	6,174,318 B1 *	1/2001	Bates et al.	606/114
5,613,973 A	3/1997	Jackson et al.	606/113	6,224,612 B1 *	5/2001	Bates et al.	606/114
5,632,746 A	5/1997	Middleman et al.	606/78				

* cited by examiner

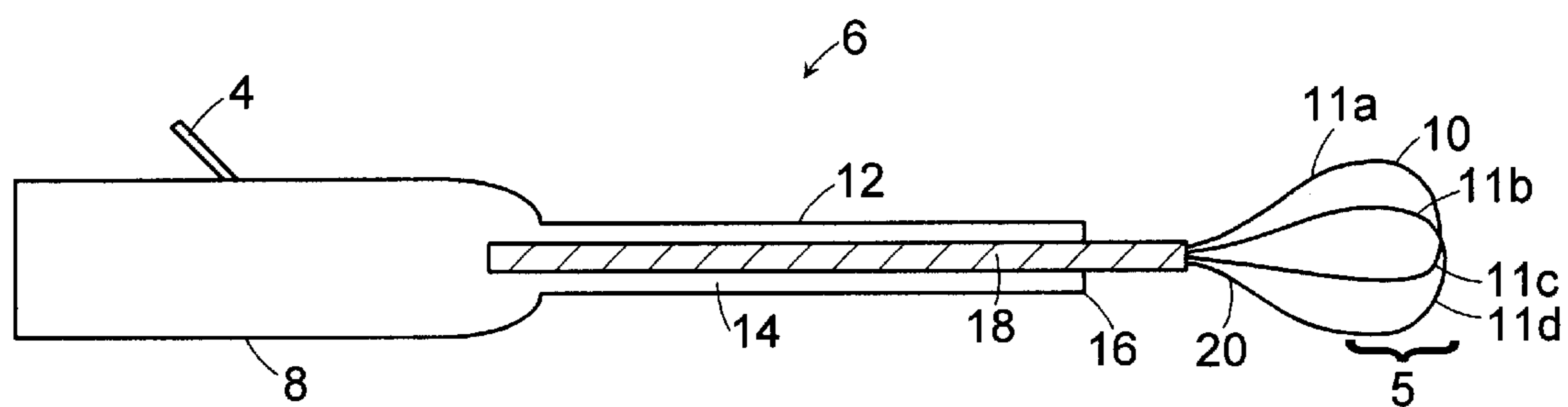


FIG. 1a

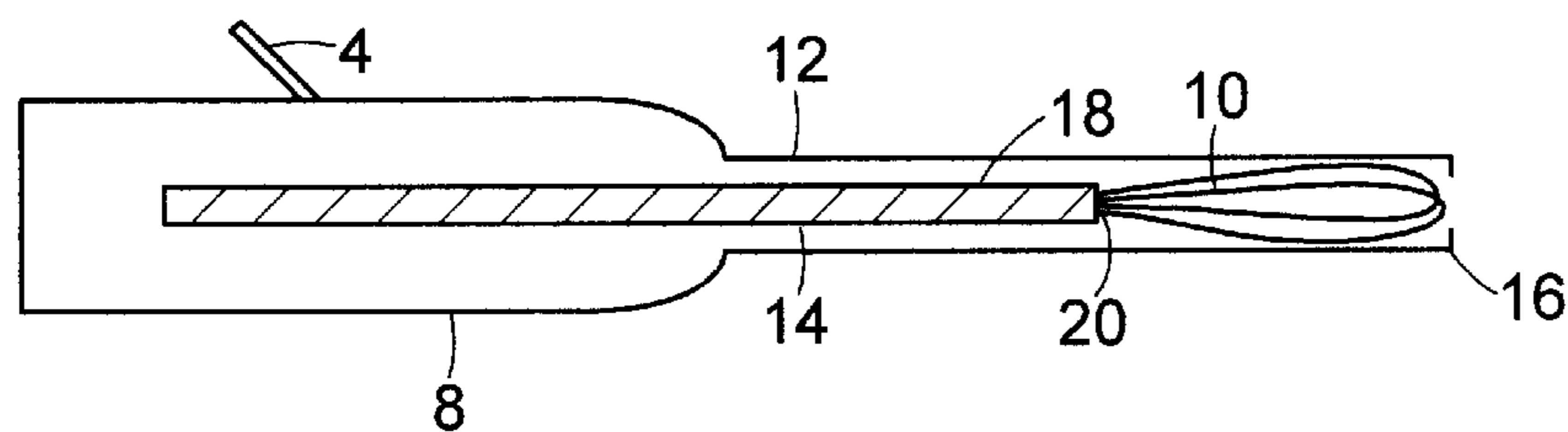


FIG. 1b

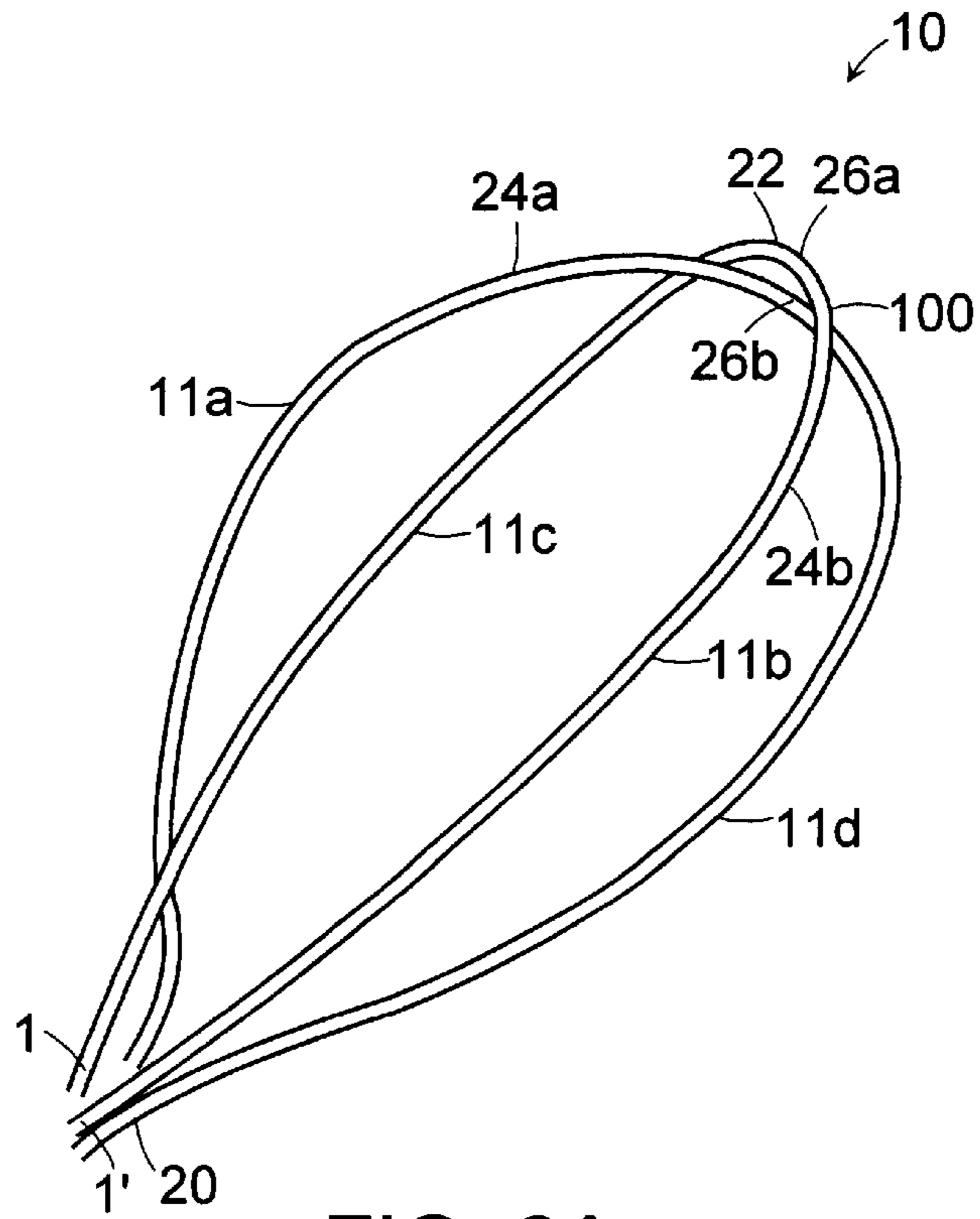


FIG. 2A

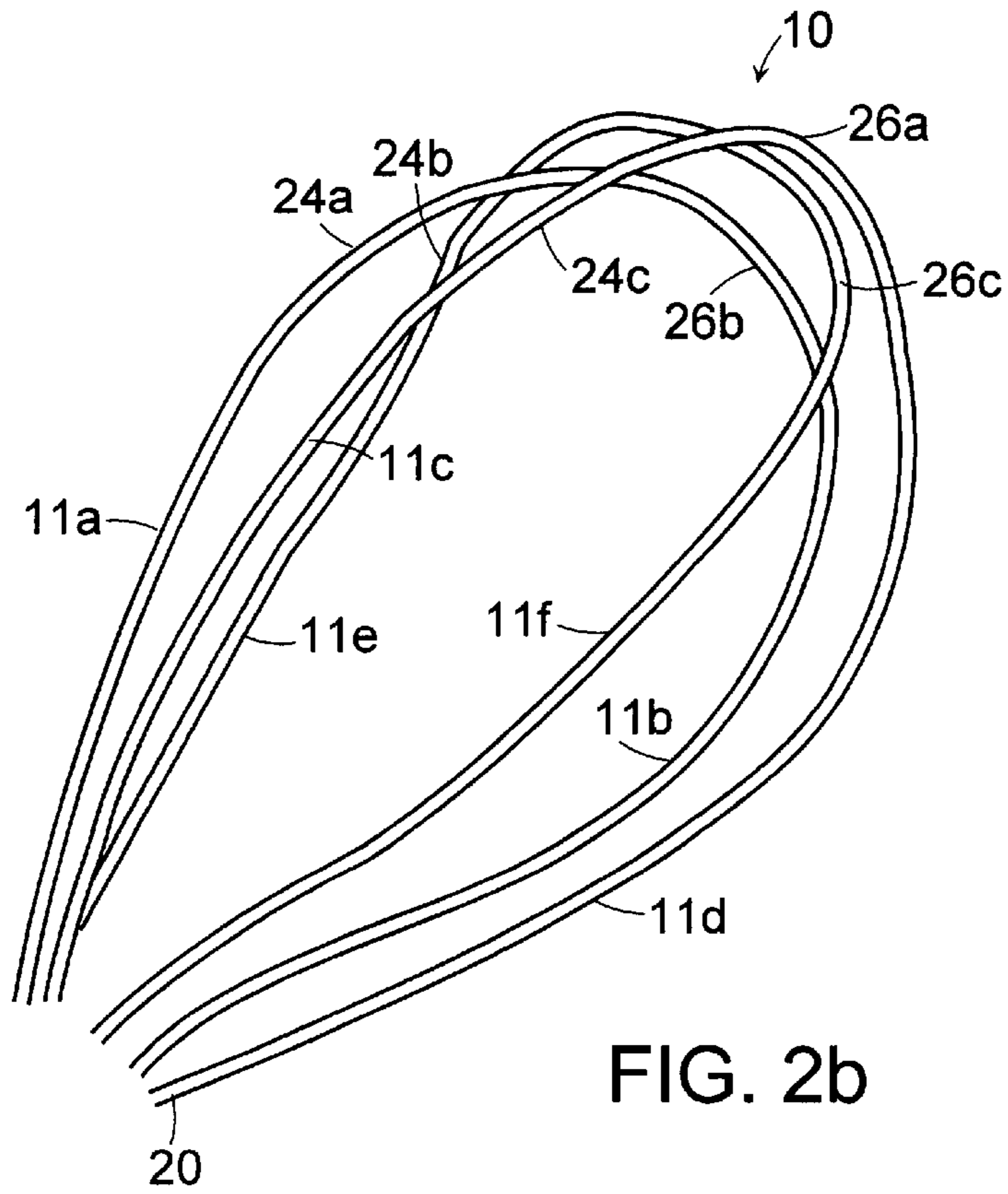


FIG. 2b

MEDICAL RETRIEVAL DEVICE WITH LOOP BASKET

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on and claims priority to provisional U.S. patent application Ser. No. 60/082,810 which was filed on Apr. 23, 1998, and U.S. provisional patent application Ser. No. 60/105,448 which was filed on Oct. 23, 1998.

TECHNICAL FIELD

The invention relates generally to medical devices for retrieving material from within a body. More particularly, the invention relates to medical retrieval baskets that have atraumatic distal ends that are contoured or tipless both to minimize the chances of damage to tissue during use and to enhance the ability of the basket to capture material (e.g., stones) disposed or lodged in "pockets" or other areas that are difficult to access in the body.

BACKGROUND INFORMATION

Known stone retrieval devices typically have baskets that are constructed by joining multiple legs together at a base of the basket and at a distal end or tip of the basket such that a "cage" is formed. At the distal tip, the individual legs are joined by soldering, adhesives, etc. such that a protruding tip results. This protrusion or outward projection at the distal end of the basket can poke tissue and cause tissue trauma. In general, the tips or ends of known baskets protrude outward and thus can cause damage by poking or piercing tissue. Also, the protruding tips of known baskets generally do not permit access to or intimate contact with certain areas within the body such as "pockets," and thus stones residing in such areas are difficult or impossible to retrieve with known baskets.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a medical retrieval basket that does not have a substantially protruding distal basket end or basket tip. That is, a basket according to the invention is atraumatic and does not have any significant distal protrusion or outward projection that can poke tissue, pierce tissue, or otherwise cause trauma to tissue.

It is another object of the invention to provide a medical retrieval basket that permits access to and/or intimate contact with certain areas within the body such as "pockets" where material to be retrieved (e.g., stones) might reside or be lodged, impacted, or embedded. A tipless or contoured tip basket arrangement can access these areas and retrieve material from those areas whereas a conventional basket with a traumatic tip would not be able to do so because of the traumatic protruding tip that prevents intimate contact between the distal end of the basket and body tissue.

It is yet another object of the invention to provide a method of using such baskets to retrieve material from within a body. The material can be biological or foreign matter. The material can be, for example, urological stones or any of a variety of other types of material found in the body.

A basket according to the invention is formed by a plurality of wires, each wire forming a loop. Thus, the basket according to the invention is tipless and atraumatic, and lacks a protruding distal tip.

The invention generally relates to a medical retrieval device. The device comprises a sheath, a handle, and an

atraumatic basket. The sheath has a proximal end and a distal end. The handle is located at the proximal end of the sheath. The basket can remove material from a body, and it is moveable between a collapsed position when the basket is enclosed within the sheath and an expanded position when the basket is extended from the distal end of the sheath. The basket has four or more legs (e.g., six, or eight legs). At least a distal end portion of the atraumatic basket is tipless and formed by a plurality of wires, each wire forming a loop. The apex of each of the loops is positioned at the distal end of the basket. The ends of each loop are attached to one another at the basket base or to an elongated member. The loops are unattached and freely moveable at the distal end of the basket.

The foregoing and other objects, aspects, features, and advantages of the invention will become more apparent from the following description and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. 1A illustrates one embodiment of a medical retrieval device with an atraumatic basket according to the invention with the basket in an expanded position.

FIG. 1B illustrates one embodiment of a medical retrieval device with an atraumatic basket according to the invention with the basket in a collapsed position.

FIG. 2A illustrates an embodiment according to the invention of a basket formed by a plurality of loops, the loops being unattached where the loops intersect at the distal end of the basket.

FIG. 2B illustrates an embodiment according to the invention of another embodiment of the basket illustrated in FIG. 2A comprising more than two basket loops.

DESCRIPTION

The basket **10** shown in FIG. 1A is the type that can be collapsed within a sheath **12** for entry into the body. A medical device or extractor **6** that includes the basket **10** of the invention also includes the sheath **12** and a proximal handle **8**. The handle **8**, sheath **12** and basket **10** illustrated in FIGS. 1A and 1B are not shown in their correct size or proportion to each other. The sheath **12** has at least one lumen **14** therein, and it extends from the handle **8** to a distal sheath end **16**. An elongated member such as a cable, coil, shaft, guidewire or mandril wire **18** extends within the lumen **14** from an actuating mechanism **4** at the device handle **8** to the base **20** of the basket **10** where the cable **18** is attached to the basket base **20**. Operation of the actuating mechanism **4** by an operator causes the basket **10** to move relative to the sheath **12** between a collapsed position within the sheath **12** as illustrated in FIG. 1B to an extended position outside of the sheath **12** where the basket **10** is open/expanded and extending beyond the distal end of the sheath **16** as shown in FIG. 1A. Alternatively, the mechanism **4** can cause movement of the sheath **12** to advance the sheath **12** over the stationary basket **10** and cable **18** combination, to thereby collapse the basket **10** within the sheath **12**, and the mechanism **4** can slide the moveable sheath **12** back to expose the stationary basket **10** and allow it to open/expand. In general, both types of basket/sheath movement configurations and related handle mechanisms

are known, and can be seen in existing product designs available from, for example, Boston Scientific Corporation (Natick, Mass.). With the basket withdrawn into and collapsed within the sheath **12** as shown in FIG. **1B**, the sheath **12** can be inserted into the body by an operator to a site in the body where the material to be retrieved is located (e.g., a stone in the ureter). The basket **10** is then moved relative to the sheath **12** and placed in the extended position, as illustrated in FIG. **1A**, such that the basket **10** dilates the body tract and can be manipulated by the operator to entrap or capture material within the basket **10**. The basket **10** can then be moved relative to the sheath **12** to cause the legs **11a**, **11b**, **11c**, **11d** of the basket **10** to close around the material and capture it. The captured material is then withdrawn from the body along with the sheath and the basket that is holding the material.

Referring to FIGS. **2A** and **2B**, a tipless end **22** of the atraumatic basket **10** is constructed by using single wires to form loops **24a**, **24b** having legs **11a**, **11b**, **11c**, **11d** extending from the apex **26a**, **26b** of the loops **24a** and **24b**, respectively, the apex **26a**, **26b** positioned at the basket distal end **22**. A plurality of pre-formed wire loops is included in a three-dimensional, atraumatic basket. In this embodiment of an atraumatic wire basket, for example, two wire loops **24a**, **24b** may be used to form a basket with four legs **11a**, **11b**, **11c**, **11d** as shown in FIG. **2A**, and three wire loops **24a**, **24b**, **24c** may be used to form a basket with six legs **11a**, **11b**, **11c**, **11d**, **11e**, **11f** as shown in FIG. **2B**. Additional wire loops may be used to form a basket with more than the four or six legs shown. The apex **26** of each wire loop **24** intersects the apex **26** of the other wire loops **24** of the basket **10** at the basket distal end **22**. The wire loops **24** at the basket distal end are free to slide by one another, i.e., they are not affixed, fused, soldered, welded, glued, joined, secured or attached to one another. The advantages of this configuration of the basket distal end **22** is that the basket end **22** is atraumatic and provides flexibility thereby enhancing the ease by which stones are captured. The two end-sections **1**, **1'** of each wire loop are brought together at the basket base **20** and held in place by welding, soldering, ligating, gluing, crimping or any other means known in the art. In one embodiment, the end-sections **1**, **1'** of the wire loops are affixed (not shown) to a cable, coil, shaft, mandril wire or guidewire **18** that runs longitudinally in a sheath **12** as shown in FIG. **1A** and FIG. **1B**.

In yet another aspect, the invention relates to a method for retrieving material from a body such as a body tract or body canal. Material (e.g., biological or foreign) can be retrieved from a body by using a tipless, atraumatic wire basket, each wire forming a loop and having an atraumatic distal basket end according to the invention. The basket of the retrieval device has an atraumatic distal end and thus allows the capture of material that is located in pockets or other difficult-to-access areas within the body. Because the distal basket end is atraumatic, it can make intimate contact with the surface of tissue, even the walls or lining of a pocket-type area, and allow the retrieval of stones or other materials that are unrecoverable with conventional tipped baskets that can cause tissue trauma and are limited in how close the basket can get to the tissue by the existence of the protruding tip. A method for retrieving material from a body includes inserting a retrieval device according to the invention into the body, moving the tipless basket into the extended position, maneuvering the basket via the proximal handle (which is located outside of the body) of the retrieval device until the material (e.g., stone) is entrapped within the three-dimensional basket structure, and then capturing the mate-

rial within the basket by moving the basket relative to the sheath to close the basket legs around the material. With the material so gripped or held by the basket, the basket can be withdrawn from the body to remove the material from the body. The materials that can be captured with tipless baskets according to the invention include a calculus, or a stone, such as a kidney stone, a ureteral stone, a urinary bladder stone, a gall bladder stone, or a stone within the biliary tree.

Variations, modifications, and other implementations of what is described herein will occur to those of ordinary skill in the art without departing from the spirit and the scope of the invention as claimed. Accordingly, the invention is to be defined not by the preceding illustrative description but instead by the spirit and scope of the following claims.

What is claimed is:

1. A medical retrieval device, comprising:

a sheath having a lumen, proximal end, and a distal end; a handle at the proximal end of the sheath; and

an atraumatic basket for atraumatically removing material from a body, the basket having a collapsed position where the basket is enclosed within the sheath and an expanded position where the basket extends from the distal end of the sheath, the basket comprising two or more pairs of basket legs, each pair of basket legs formed from a single wire loop, and each pair of said basket legs crossing each other and being unattached and freely moveable with respect to each other at a distal end of the basket when said basket is in the collapsed position or the expanded position.

2. The medical device of claim 1 wherein said basket comprises three pairs of basket legs.

3. The medical device of claim 1 wherein said sheath is movable over the basket, wherein said basket is in the collapsed position when the sheath is advanced over the basket, and said basket is in the expanded position when the sheath is retracted from the basket.

4. The medical device of claim 1 further comprising an elongated member, said elongated member axially moveable in said sheath lumen, said basket joined at a proximal end of said basket to the distal end of said elongated member, wherein axial movement of said elongated member moves said basket between the expanded position and the collapsed position.

5. A method for retrieving material from a body, comprising:

inserting a retrieval device into said body, the retrieval device comprising a sheath having a proximal end and a distal end, a handle at the proximal end of the sheath, and an atraumatic basket for atraumatically removing material from a body, the basket having a collapsed position where the basket is enclosed within the sheath, and an expanded position where the basket extends from the distal end of the sheath, the basket comprising two or more pairs of basket legs, each pair of basket legs formed from a single wire loop, and each pair of said basket legs crossing each other and being unattached and freely moveable with respect to each other at a distal end of the basket when said basket is in the collapsed or the expanded position;

atraumatically capturing the material within the basket; and

withdrawing the retrieval device from the body to remove the captured material from the body.

6. The method of claim 2 wherein said material retrieved from said body comprises a kidney stone.

5

- 7. The method of claim 2 wherein said material retrieved from said body comprises a ureteral stone.
- 8. The method of claim 2 wherein said material retrieved from said body comprises a urinary bladder stone.
- 9. The method of claim 2 wherein said material retrieved from said body comprises a urethral stone.

6

- 10. The method of claim 1 wherein said material retrieved from said body comprises a gall bladder stone.
- 11. The method of claim 2 wherein said material retrieved from said body comprises a biliary stone.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,626,915 B1
DATED : September 30, 2003
INVENTOR(S) : Leveillee

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 4,

Line 40, replace "sa" with -- said --;
Line 64, replace "2" with -- 5 --;

Column 5,

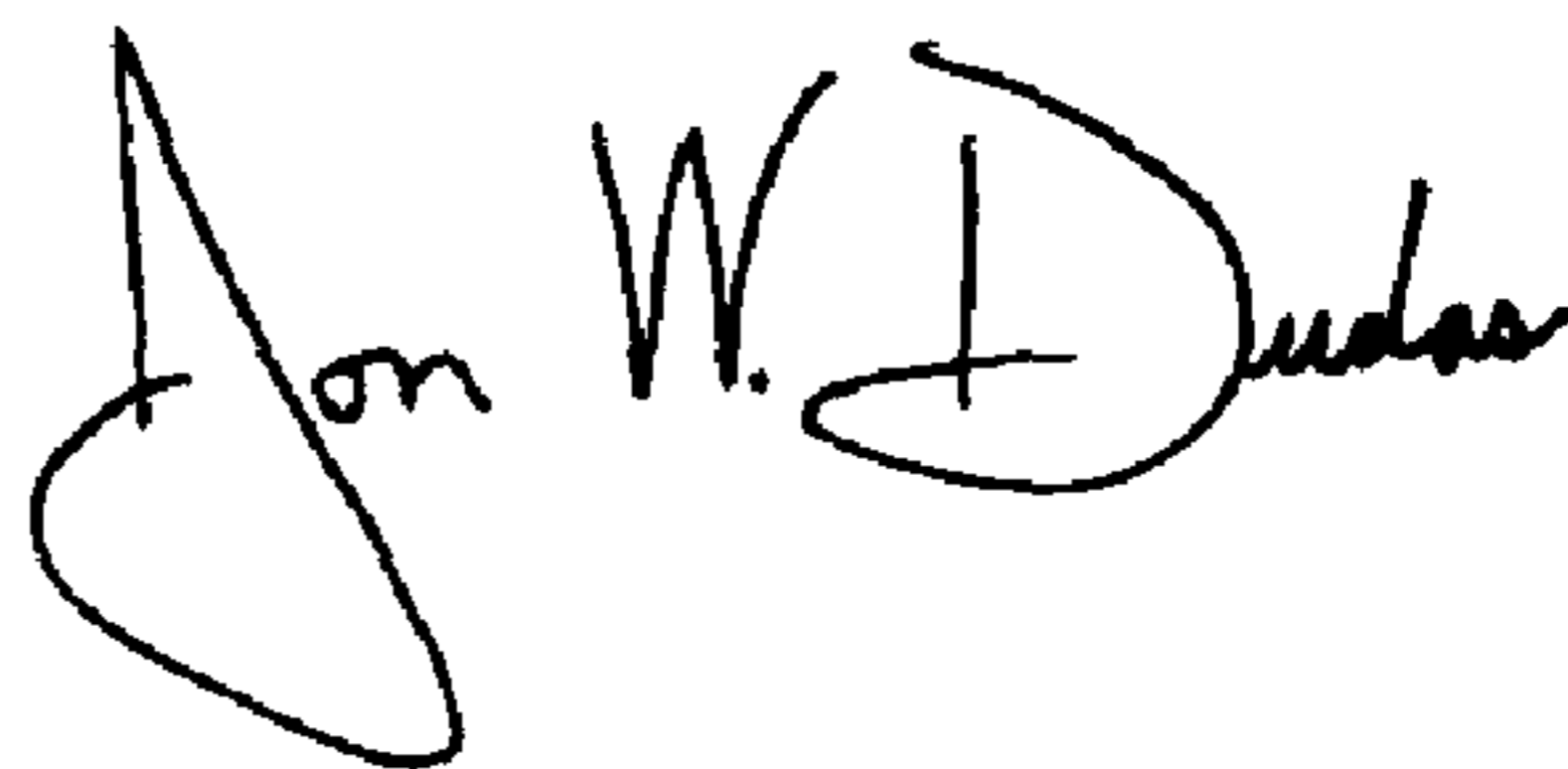
Line 1, replace "2" with -- 5 --;
Line 3, replace "2" with -- 5 --;
Line 5, replace "2" with -- 5 --;

Column 6,

Line 3, replace "2" with -- 5 --.

Signed and Sealed this

Thirtieth Day of March, 2004

A handwritten signature in black ink that reads "Jon W. Dudas". The signature is written in a cursive style with a large, looped initial "J".

JON W. DUDAS
Acting Director of the United States Patent and Trademark Office